Minimal Access Aortic Valve Replacement: Who Gains the Most?

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Introduction

Aortic valve stenosis is the most common acquired valve lesion among the elderly in the Western societies.

Isolated aortic valve replacement is usually conducted via a median sternotomy which divides the sternum fully.

Partial sternotomy aortic valve replacement (mini-AVR) leads to reduced surgical morbidity, reduced blood transfusion requirements, less post-operative pain and quicker recovery by maintaining sternal integrity.

We investigated the impact of utilising a partial sternotomy (upper 'J'-type) for isolated aortic valve replacement against conventional sternotomy in elderly patients and compared the outcomes including blood transfusion requirements.

mini-AVR technique

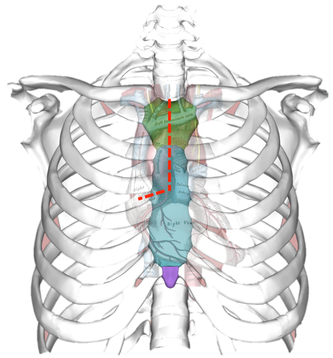


Fig 1. Demonstration of J-shaped mini-sternotomy (red dotted line). Access to right atrium for venous cannulation can pose a challenge.

Methods

Operative records of patients aged 70 years and over, undergoing isolated aortic valve replacements were retrieved between 2014 and 2020.

We compared patients demographics and peri-operative data between the two groups undergoing conventional sternotomy (group A) and partial sternotomy (group B).

The primary outcome was mortality. Secondary outcomes were surrogates of morbidity which included proportion of patients requiring more than 24 hours of intensive care, post-operative length of stay and blood transfusion requirements.

Categorical variables were compared using Chi-squared test, continuous variables were compared using the Mann-Whitney test, following determination of the non-normal distribution of data.

Results

373 patients in Group A and 97 patients in Group B underwent isolated aortic valve replacement with conventional and partial sternotomy incisions respectively.

There was an increased proportion of pre-existing co-morbidities in Group B as reflected in the significantly greater EuroScore (8.9% vs 10.4%, $p<0.05$). Group B benefited from shorter cardiopulmonary bypass (99.5 vs 74.4 mins, $p<0.0001$) and cross-clamp times (81.5 vs 62.7 mins, $p<0.0001$).

There was no significant difference in the primary outcome of mortality (1.1% vs 0%, $p = 0.306$).

	Group A	Group B	Significant?	Significance level
Demographics				
Age (years)	77.8 (4.5)	78.8 (5.2)		0.085
Female Gender (%)	47.7%	48.5%		0.898
Arteriopathy	2.9%	7.2%		0.051
LVEF <50%	18.2%	23.7%		0.224
Smoking history	49.1%	63.9%	**	0.009
Diabetes on treatment	86.1%	83.5%		0.524
Logistic Euroscore	8.9 (6.1)	10.4 (7.5)	*	0.048
Intra-op				
CPB time(min)	99.5 (17.7)	74.4 (19.8)	***	<0.0001
Cross-clamp time (min)	81.5 (15.4)	62.7 (16.1)	***	<0.0001
Post-op morbidity/mortality				
ICU Stay >24h	49.7%	38.3%		0.050
Post-op stay (days)	9.9 (7.7)	8.1 (8.6)	***	<0.0001
Blood usage (units)	2.3 (2.9)	1.5 (2.1)	**	0.009
Mortality (%)	1.1%	0%		0.306

Fig 2. Comparison of demographics, primary and secondary outcomes. Standard deviations are given within brackets beside mean values.

The intensive care utilisation more than 24 hours (49.7% vs 38.3%, $p=0.050$) was significantly lower in Group B, who also had a significantly shorter post-operative hospital stay (9.9 vs 8.1 days, $p<0.0001$).

There was a significantly lower usage of packed red cell units in Group B (2.3 vs 1.5 units, $p=0.009$).

Conclusion

We have demonstrated that minimal access approach aortic valve replacement can provide substantial clinical benefits, in particular the elderly and co-morbid patients, in addition to utilising fewer hospital resources such as post-operative care facilities, length of stay and blood products.

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